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GEOMYERSIA GLABRA, A NEW GENUS AND SPECIES OF SCINCID LIZARD FROM BOUGAINVILLE, SOLOMON ISLANDS, WITH COMMENTS ON THE RELATIONSHIPS OF SOME LYGOSOMINE GENERA

Allen E. Greer and Fred Parker[1]

ABSTRACT. A new genus and species of skink, *Geomyersia glabra,* is described from Bougainville, Solomon Islands. Notes on the reproduction and ecology of the species are presented along with a generic diagnosis and description.

The large group of skinks centering on *Leiolopisma* (as used in its broadest context) is divided into two major subgroups on the basis of the relationships of the bones in the secondary palate; the alphas are wide ranging throughout the Old and New World whereas the betas, which appear to be derived from the alphas, are confined to subsaharan Africa and the Australian Region. *Geomyersia glabra* is a beta skink. The relationships between the African and Australian Region betas are obscure as yet, but the relationships of the taxa within these two groups are somewhat clearer. *G. glabra* appears to be a part of the radiation of the betas in the Australian Region.

INTRODUCTION

Recently one of us (Parker) obtained in the highlands of Bougainville a new species of cryptic skink that possesses the following combination of characters unique in lygosomine skinks: translucent spectacle in the movable lower eyelid; prefrontals absent; single frontoparietal; a single median scale situated between the single pair of nuchal scales; minute external ear opening; and pentadactyl limbs.

As the proper generic allocation of the new species was not clear from these external characters, a skull was prepared for comparison with the skulls of more than 350 species of skinks. The skull morphology immediately allowed us to recognize the nearest relatives of the new skink and determine that skull characters in combination with the external characters warrant separate generic status for the species.

[1] Kundiawa, Chimbu District, Territory of New Guinea.

SYSTEMATIC DESCRIPTION

The new genus and species may be known as:

GEOMYERSIA GLABRA[1] new genus and species

Holotype: Museum of Comparative Zoology 93714, collected by natives for Fred Parker at Mutahi, Bougainville (elevation 2200-3200 feet) on 18 May 1966.

Paratypes (7 specimens): MCZ 87611, 93710, 93712, Naturhistoriska Riksmuseet (Stockholm) 67-0001, same data as holotype, but collected in the period 10-19 May 1966. MCZ 93713, Melilup, Bougainville (elev. 3000 ± 500 feet) on 14 May 1966. MCZ 93711, Ramazon River, Bougainville (elev. 1600-2400 feet) on 19 May 1966. MCZ 93708, Turiboiru, Bougainville (elev. 500 feet) on 21 March 1966.

Generic diagnosis: The genus is similar to an assemblage of lygosomine skinks inhabiting the Australian Region and subsaharan Africa. This assemblage may be characterized by the following suite of skull characters: palatal rami of pterygoids somewhat expanded and deeply emarginated posteriorly and separated medially by medioposterior processes from the palatines, which project into the interpterygoid vacuity (beta palatal pattern, see p. 10 and Figure 4); 11-15 teeth on the premaxillae; no postorbital bone; supratemporal fenestra absent or minute; and Meckel's groove obliterated by the overlapping and fusion of the dentary.

The genus *Geomyersia* may be distinguished from all other taxa in this assemblage (see p. 11) by its depressed body form, the complete absence of prefrontal scales, and the presence of a single median scale between the single pair of nuchal scales. All other taxa in the assemblage possess well-defined prefrontals and lack an "internuchal" scale. No other skink, in fact, is known to have such an internuchal scale as a normal feature (Figure 1).

Species diagnosis: The species diagnosis is the same as that for the genus.

Description (Figure 1): In general appearance *Geomyersia glabra* is a small (32-36 mm in snout-vent length), very dark, brownish black skink with a markedly depressed body form. The

[1] The genus is named for Professor George Sprague Myers of the Division of Systematic Biology, Stanford University, who stimulated the early interest of the senior author in systematic and evolutionary biology. The specific name (*glabra*) refers to the extremely smooth appearance of the species.

limbs are pentadactyl and fail to meet when adpressed to the body.

Head noticeably depressed; rostral about twice as wide as deep, forming an almost straight suture with the very large frontonasal; external naris centered in a rectangular nasal; a single loreal between the nasal and two superposed preoculars; prefrontals entirely lacking; frontal short, as long as the medial longitudinal length of the fused interparietals, and forming a shallow, but broad, concave suture with the frontonasal; frontal in contact with the two anteriormost of the four supraoculars; lower eyelid movable with a large translucent spectacle; small scales of eyelid separated from supralabial scales by complete row of suboculars; 6-6 supralabials, 4th supralabial below center of eye; frontoparietals fused into a single scale; interparietal distinct, shorter than medial longitudinal length of the single frontoparietal; parietals large, forming a suture approximately two-thirds the length of interparietal; each parietal bordered posteriorly by a single large nuchal and temporal; a small, median scale separates the pair of nuchals.

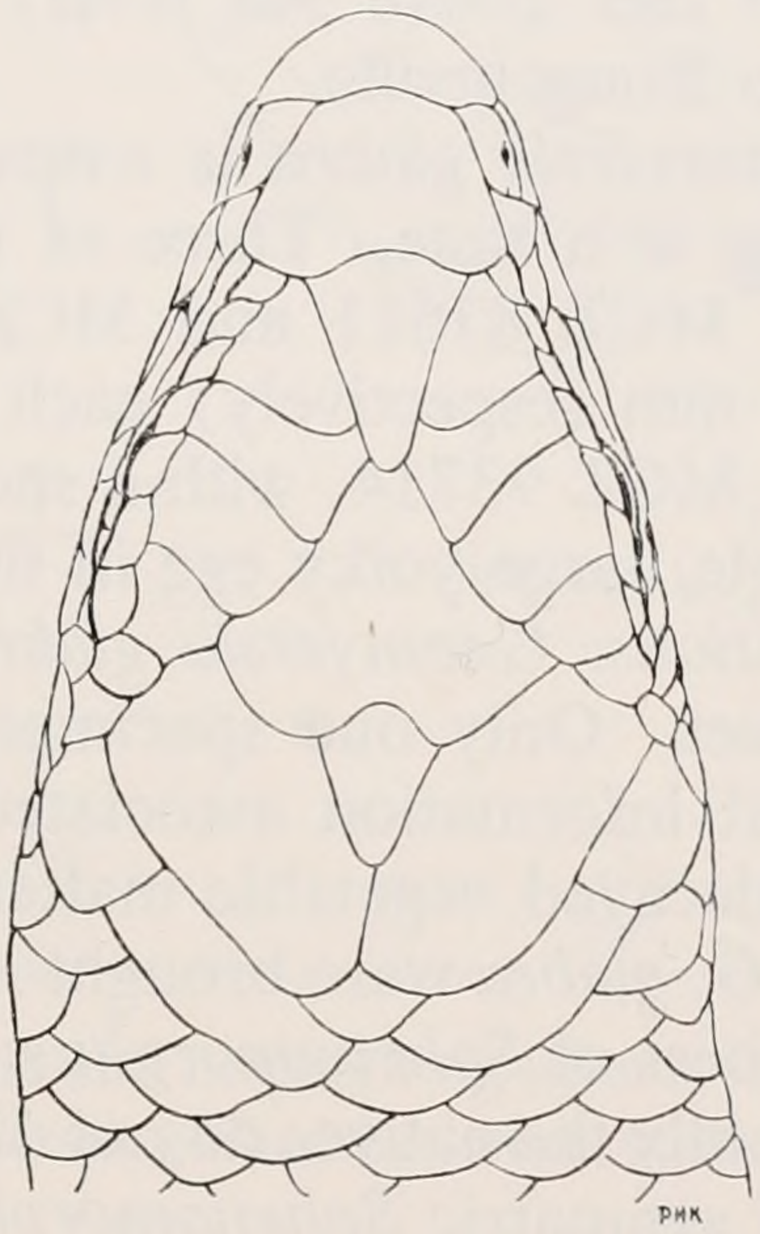


Figure 1. Dorsal view of the head of the holotype of *Geomyersia glabra* (MCZ 93714). Notice the absence of prefrontal scales and the presence of the single frontoparietal and internuchal.

Tympanum sunk below level of epidermis; external ear opening present but minute and without auricular lobes; body scales smooth, slightly iridescent, and disposed in 22-24 longitudinal rows around midbody; a median pair of enlarged preanal scales bordered laterally

by two subequal scales; median row of subcaudal scales transversely enlarged.

Dorsal surface of digits covered by a single row of scales (Group 1 of Brongersma, 1942); 11-15 subdigital lamellae beneath 4th (longest) toe; lamellae folded into a median and two lateral ridges.

Color: The dorsum and sides are dark grayish brown to brownish black; a median series of anteriorly-directed dark brownish black chevrons begin on the base of the tail and extend forward to the nape; three or four horizontal streaks composed of long dark dashes extend along the centers of the lateral scale rows between the fore and hind legs. Color does not appear to alter with preservation.

The head is as dark as the dorsum, except for light cream stripes along the sutures between the supralabials. The venter is light with thickly clustered dark spots which become more confluent and dense posteriorly. The underside of the tail is so heavily spotted as to be almost uniformly dark.

Distribution (Figure 2): The species is known only from middle elevations (500-3500 feet above sea level) in the highlands of northern and southern Bougainville.

Reproduction: Geomyersia glabra is oviparous and apparently lays only a single egg at a time. Three of the seven individuals known were gravid. MCZ 87611 and MCZ 93712 (snout-vent lengths 35.5 and 34 mm respectively) each contained 1 oblong, leathery shelled egg. MCZ 93714, with a snout-vent length of 33 mm, contained a single, large yolky egg in the oviduct.

Ecological observations: Geomyersia glabra has been collected between 500-3500 feet. Only one specimen (MCZ 93708) has any precise ecological information associated with it. This individual was found in decayed vegetable matter in secondary forest. All the specimens of *G. glabra* were brought in by native collectors along with large numbers of *Sphenomorphus* (especially *solomonis* and *tanneri*). Apparently the natives do not distinguish *Geomyersia glabra* from the small sympatric *Sphenomorphus* (see Morphological Comparisons with Other Small Solomon Islands Skinks).

The few (six) specimens of *Geomyersia glabra* obtained in the Mutahi-Melilup area, in proportion to the thousands of individuals of other species collected in the same area, indicate that the species is either extremely rare or is more or less restricted to a peculiar habitat that was not widely sampled during the overall collecting.

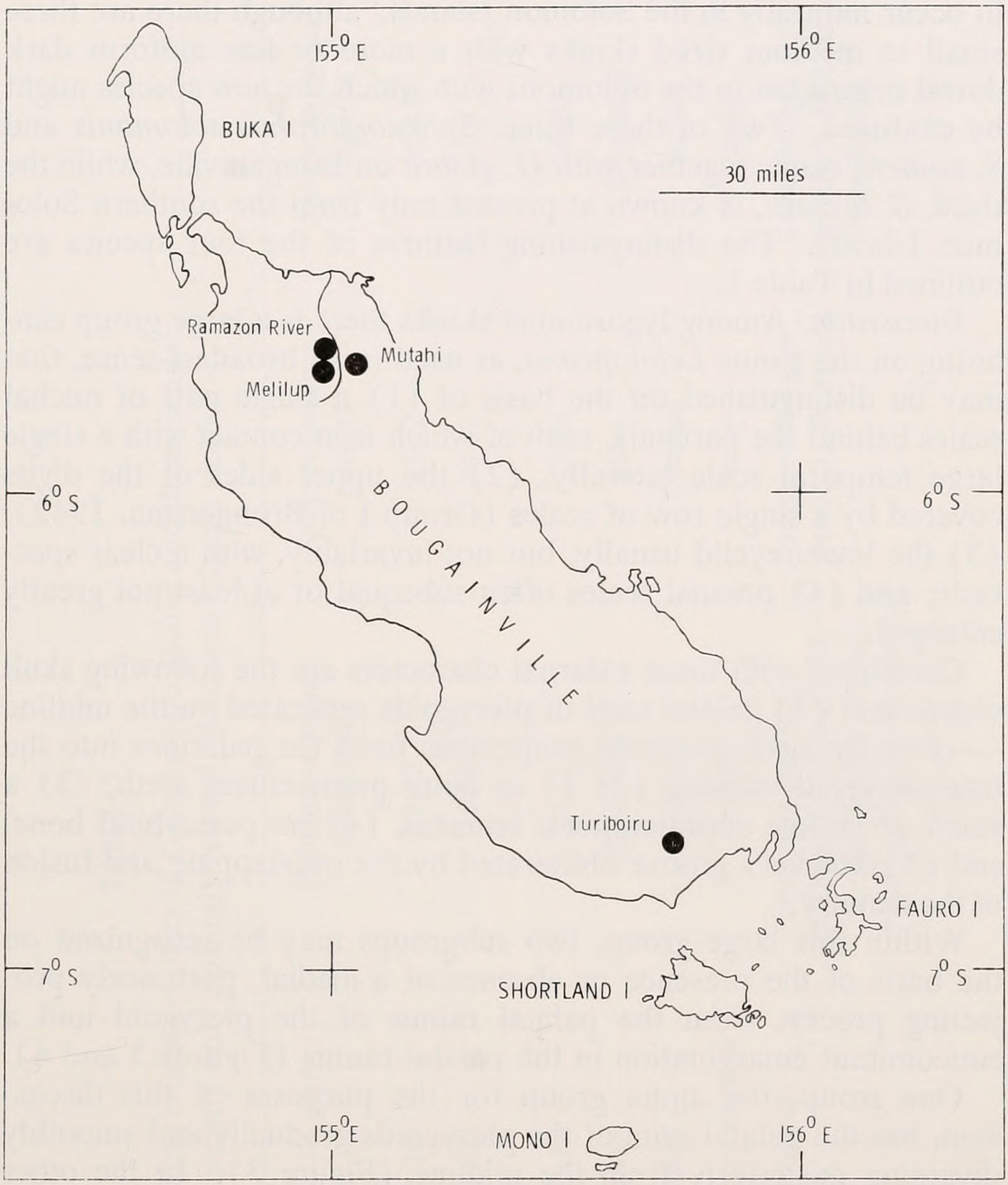


Figure 2. Bougainville and neighboring islands showing the known localities from which *Geomyersia glabra* has been collected.

The apparent rarity is not solely the result of size, as many juveniles of the small skinks are collected and the natives were offered incentives to collect the species. (Interestingly enough the largest skink in the Mutahi-Melilup area, *Sphenomorphus taylori,* is as infrequently collected as is *Geomyersia glabra.*)

Morphological Comparisons with Other Small Solomon Islands Skinks: No close relatives of the monotypic *Geomyersia* are known

to occur naturally in the Solomon Islands,[1] although there are three small to medium sized skinks with a more or less uniform dark dorsal coloration in the Solomons with which the new species might be confused. Two of these three, *Sphenomorphus solomonis* and *S. tanneri,* occur together with *G. glabra* on Bougainville, while the third, *S. bignelli,* is known at present only from the southern Solomon Islands. The distinguishing features of the four species are outlined in Table 1.

Discussion: Among lygosomine skinks there is a large group centering on the genus *Leiolopisma,* as used in its broadest sense, that may be distinguished on the basis of (1) a single pair of nuchal scales behind the parietals, each of which is in contact with a single large temporal scale laterally, (2) the upper sides of the digits covered by a single row of scales (Group I of Brongersma, 1942), (3) the lower eyelid usually, but not invariably, with a clear spectacle, and (4) preanal scales often subequal or at least not greatly enlarged.

Correlated with these external characters are the following skull characters: (1) palatal rami of pterygoids separated on the midline — often by medioposterior projections from the palatines into the interpterygoid vacuity, (2) 11 or more premaxillary teeth, (3) a small or minute supratemporal fenestra, (4) no postorbital bone, and (5) Meckel's groove obliterated by the overlapping and fusion of the dentary.

Within this large group, two subgroups may be recognized on the basis of the presence or absence of a medial, posteriorly projecting process from the palatal ramus of the pterygoid and a concomitant emargination in the palatal ramus (Figures 3 and 4).

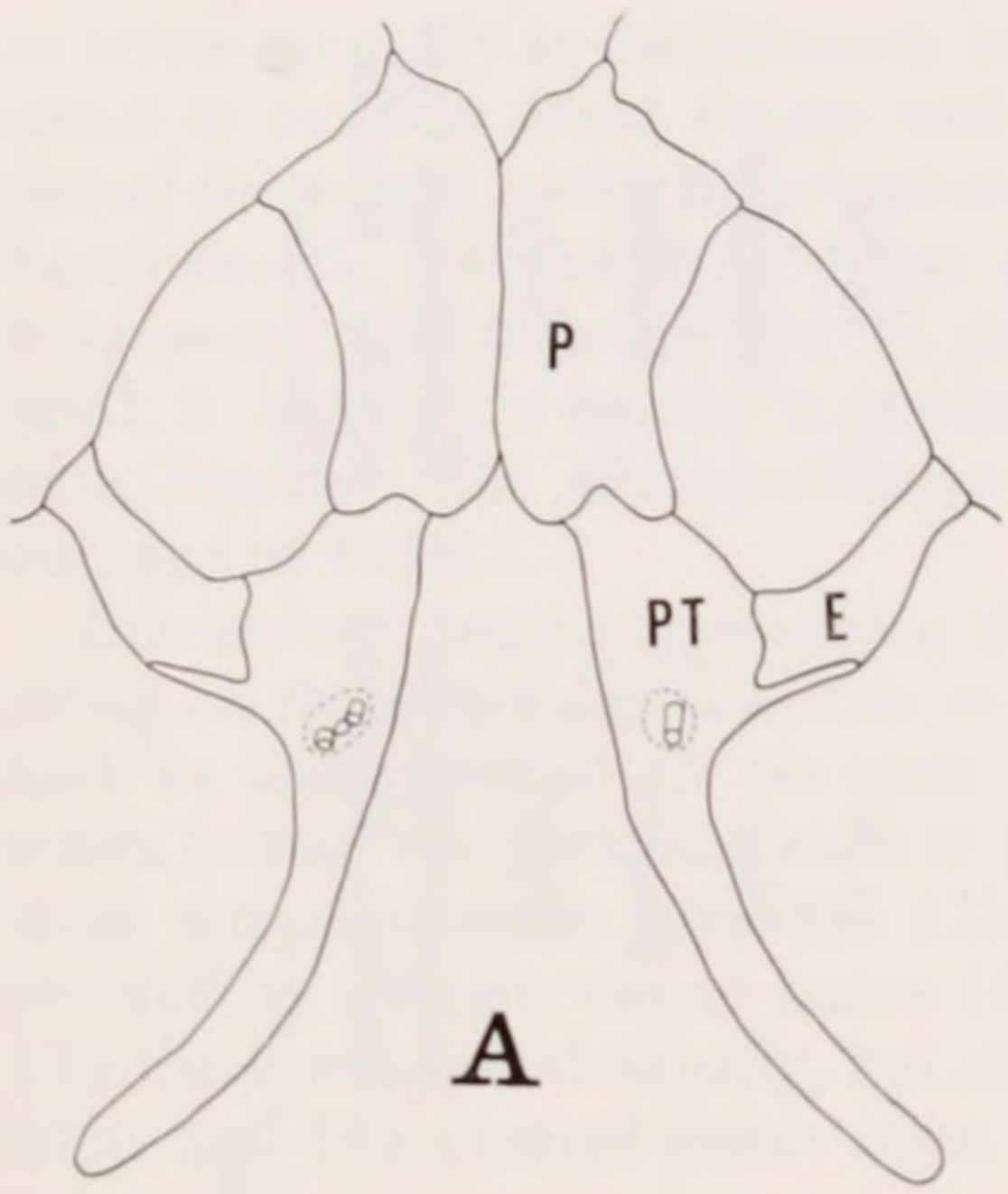
One group, the alpha group for the purposes of this discussion, has the palatal rami of the pterygoids gradually and smoothly diverging posteriorly from the midline (Figure 3). In the other

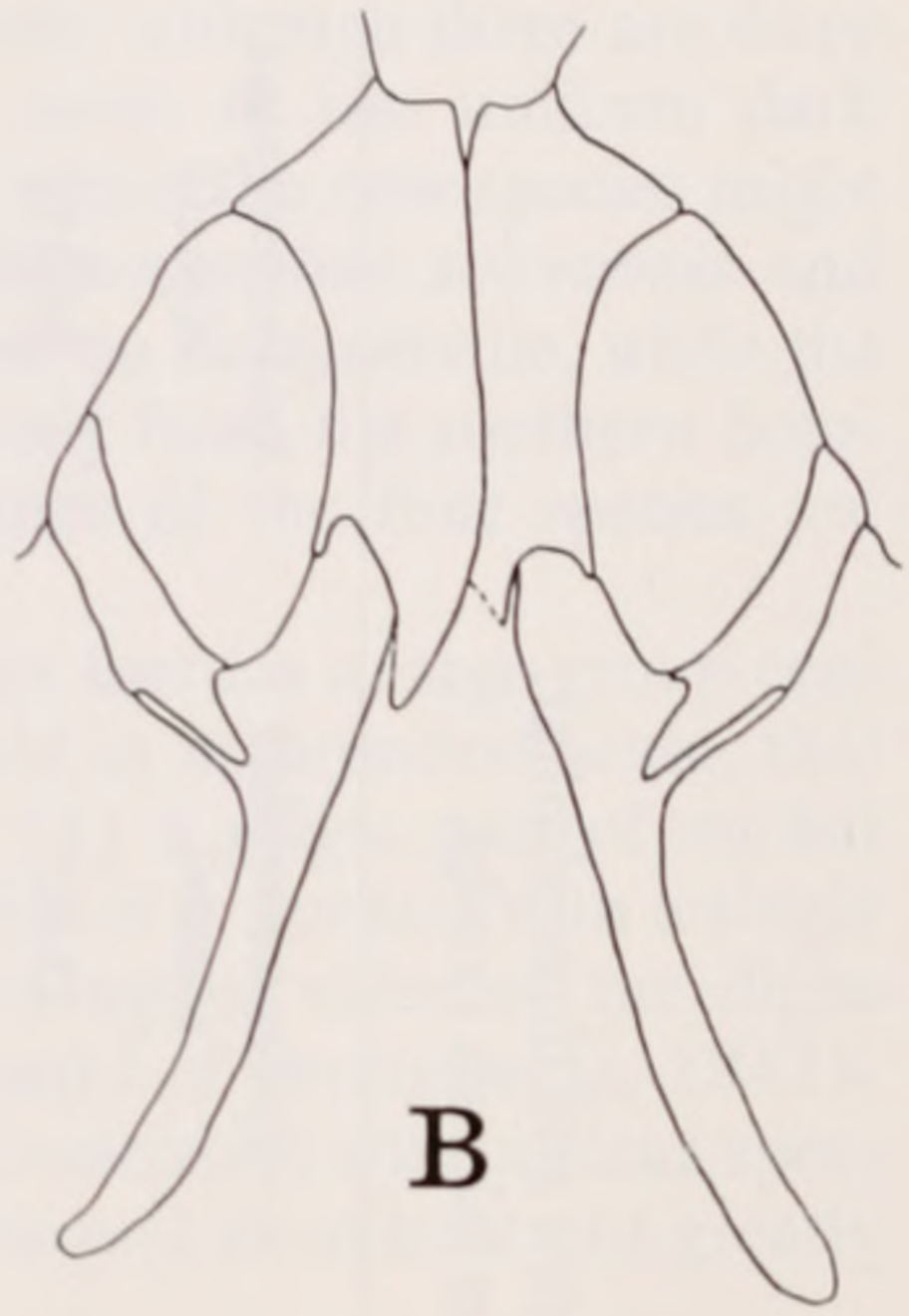
[1] *Carlia fusca,* a close relative of *Geomyersia glabra* (see below), is known to occur in the Solomon Islands only on tiny Sohano Island in the strait between Buka and Bougainville, on Faisi Island and at Buin, Bougainville. The species is as yet unknown from any other localities in the Solomons, and it has almost certainly been introduced in the known localities. *C. fusca* is very common around the town of Rabaul, New Britain, the port from which Bougainville receives most of its supplies. The ecology of the species in Rabaul, the Solomons, and New Guinea is similar. It is a grass-dweller, preferring the thick tussock grass of open areas.

TABLE 1

Distinguishing characteristics of *Geomyersia glabra* and three similar, but apparently only distantly related, Solomon Islands skinks.

	Geomyersia glabra	*Sphenomorphus solomonis*	*Sphenomorphus tanneri*	*Sphenomorphus bignelli*
Snout-vent length (mm)	32-36	27-72	23-52	30-35
Scales around midbody	22-24	24-30	28-32	22
Subdigital lamellae (4th toe)	11-15	13-17	13-20	18-20
Prefrontals	Absent	Separated	Meet	Separated
Frontoparietals	Fused	Distinct	Distinct	Distinct
Lower eyelid	Translucent window	Scaly	Scaly	Scaly
Distribution	Bougainville	Faro (type locality), Bougainville, Shortland, Choiseul, Isabel, Ramos, Florida, Moe, Guadalcanal	Bougainville (type locality), Shortland	Kulambargra (type locality), Malaita, Guadalcanal





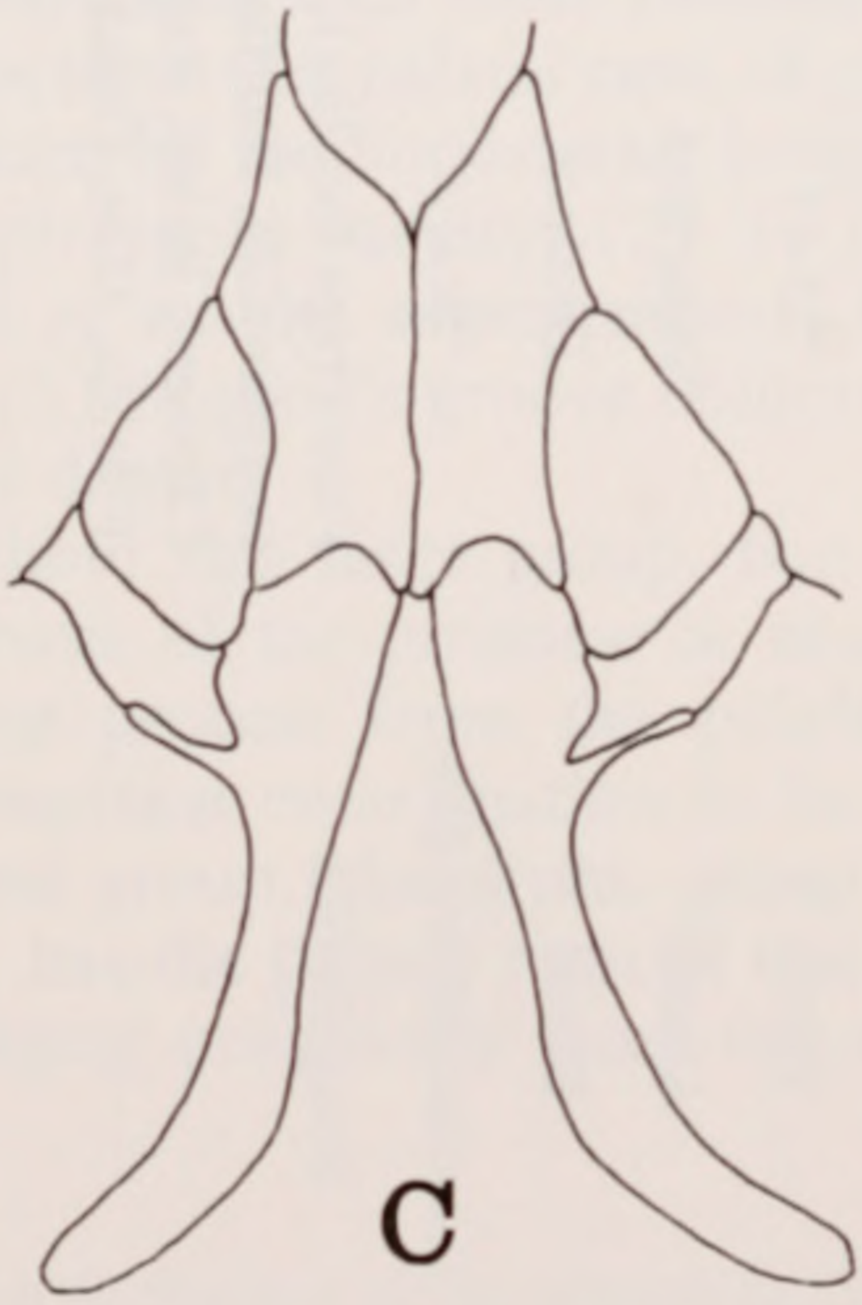


Figure 3. The alpha palatal pattern (ventral view): (A) *Mabuya polytropis* (MCZ 8103), Kribi, Cameroon; (B) *Leiolopisma metallica* (MCZ 67129), Mt. Toolbewong, Healesville, Victoria; (C) *Emoia samoense* (MCZ 16931), Fiji Islands; (D) *Eumecia anchietae* (MCZ 41562), Kaimosi, Kenya. Not drawn to scale. Abbreviations: E, ectopterygoid; P, palatine; PT, pterygoid.

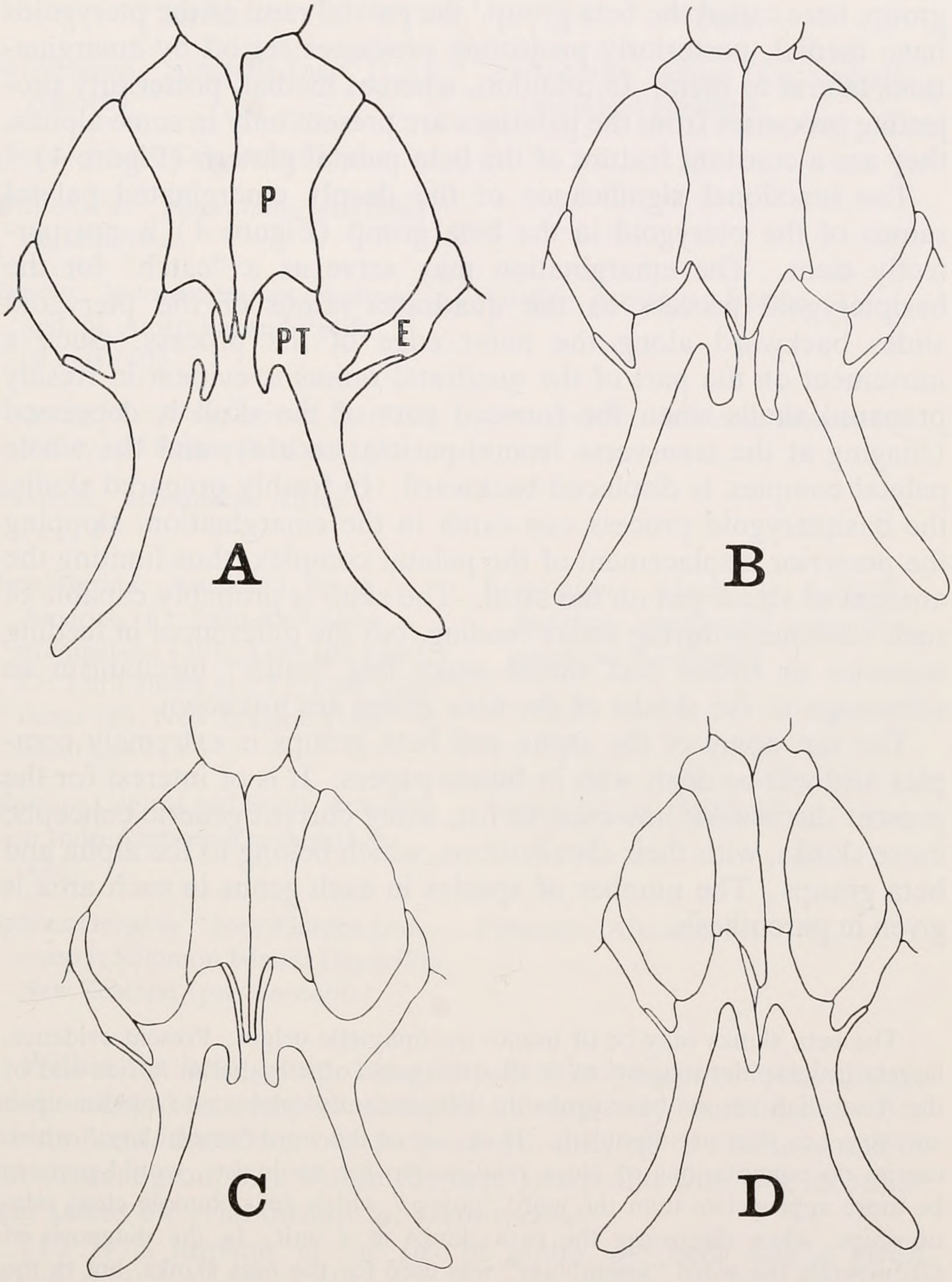


Figure 4. The beta palatal pattern (ventral view): (A) *Carlia bicarinata* (MCZ 64315), Port Moresby, New Guinea; (B) *Leptosiaphos blochmanni* (MCZ untagged), Upper Mulinga, Idjwi Island, Democratic Republic of the Congo; (C) *"Ablepharus" smithi* (MCZ 42880, paratype), Nyonga, Democratic Republic of the Congo; (D) *Geomyersia glabra* (MCZ 87611, paratype), Mutahi, Bougainville. Not drawn to scale. Abbreviations as in Figure 3.

group, here called the beta group,[1] the palatal rami of the pterygoids have medial, posteriorly projecting processes set off by emarginations lateral to them. In addition, whereas medial, posteriorly projecting processes from the palatines are present only in some alphas, they are a constant feature of the beta palatal pattern (Figure 4).

The functional significance of the deeply emarginated palatal ramus of the pterygoid in the beta group (Figure 4) is not perfectly clear. The emargination may serve as a "catch" for the basipterygoid process as the quadratal ramus of the pterygoid slides backward along the outer edge of the process. Such a movement on the part of the quadratal ramus is evident in freshly prepared skulls when the forward part of the skull is depressed (hinging at the transverse frontal-parietal suture), and the whole palatal complex is displaced backward. In freshly prepared skulls, the basipterygoid process can catch in the emargination, stopping the posterior displacement of the palatal complex, thus limiting the amount of strain put on the skull. The skull is probably capable of such movement during active feeding, but the differences in feeding behavior or habits that would make this "catch" mechanism an advantage to the skinks of the beta group are unknown.

The taxonomy of the alpha and beta groups is extremely complex and will be dealt with in future papers. It is of interest for the present discussion, however, to list, using current generic concepts, those skinks, with their distributions, which belong to the alpha and beta groups. The number of species in each genus in each area is given in parenthesis.

[1] The beta skinks may be of mono- or diphyletic origin. Present evidence, largely geographic, suggests to us that the betas of subsaharan Africa and of the Australian Region have probably independently originated from an alpha ancestry, i.e., they are diphyletic. If so, use of the word "assemblage," which carries no connotations of close relationship for zoologists, would perhaps be more appropriate than the word "group," which does connote close relationships, when discussing the beta skinks as a unit. In the diagnosis of *Geomyersia* the word "assemblage" was used for the beta skinks, but in the following discussion, largely as a matter of stylistic balance with the term "alpha group" (on present evidence the alphas are monophyletic in origin), the term "beta group" will be used. It should be borne in mind, however, that the mono- or diphyletic origin of the beta skinks is still a problem needing further research.

alpha	beta
Ablepharus Australia (part, 11); Asia (8)	*Ablepharus* Africa (6); Australia (*greyi* and *burnetti*)
Anotis New Caledonia (3)	
Didosaurus *mauritianus*, subfossil on Mauritius	
Emoia Indo-Australian archipelago, N. Australia, and Pacific islands (40)	*Carlia* Australian Region (21)
Eugongylus New Guinea, N. Australia, and Solomon Islands (5)	*Geomyersia* Solomon Islands (1)
Eumecia subsaharan Africa (1 or 2)	
Leiolopisma Asia (17); North America (6); Indo-Australian archipelago (20); Australia (part, 8); Lord Howe Is. (1); New Caledonia (6); New Zealand (16); Mauritius (1)	*Leiolopisma* Africa (7); Australia (*weeksae, challengeri, mustelina, guichenoti, delicata*)
Mabuya Central and South America; to Indo-Australian archipelago (66)	*Leptosiaphos* Africa (7
Sphenomorphus New Guinea (*mitnutus*); Solomon Islands (*bignelli*); New Zealand (*pseudornatus*)	*Panaspis* Africa (7)

Within the beta group, the group to which *Geomyersia* belongs, relationships are complex and still incompletely worked out. For the moment, therefore, our purpose will only be to discuss some of the clearest groupings within the beta group and with this information assess the relationships of *Geomyersia*.

(1) It is implicit in the list of alpha and beta skinks given above that the genus *Ablepharus*, characterized by "no movable eyelids, [and] a transparent disk covering the eye" (Boulenger, 1887), is not monophyletic; indeed, the genus is an assemblage of species, derived from diverse stocks, with a clear spectacle in the movable lower eyelid (Smith, 1935 and 1937; Greer, 1967a; Fuhn, in an unpublished discussion of the polyphyletic origin of *Ablepharus*).

The Australian *A. greyi* and *A. burnetti* (beta group) are the only "*Ablepharus*" with a reduced digital formula (4 fingers and 5 toes),[1] and significantly, they occur in the same zoogeographic region as the only other group of beta skinks with a similarly reduced digital formula, i.e., *Carlia*. The fused frontoparietal and spiny auricular lobules of *A. burnetti* are shared with *Carlia* and suggest that *A. burnetti* is simply a *Carlia* in which the movable lower eyelid with its clear spectacle has fused almost completely[2] to the upper edge of the orbit.

The 4-5 digital formula and fused frontoparietals of *A. greyi* also argue for the close relationship of this species with *Carlia,* but the unique supraocular arrangement found in *A. greyi* would suggest separate generic rank. The generic name *Menetia* Gray, 1845, originally proposed for this species, is available.

(2) The other beta skinks in the Australian region, in addition to *Carlia* and its two ablepharine derivatives discussed above, are *Geomyersia glabra* and five species referred to *Leiolopisma: weeksae, challengeri, mustelina, guichenoti,* and *delicata.* In possessing 5 fingers these five species of *Leiolopisma,* as well as *Geomyersia,* display the primitive morphological condition from which the 4-fingered condition of *Carlia* and its two ablepharine relatives must have been derived.

Three of the 5 beta Australian *Leiolopisma* display yet another primitive character from which a more advanced character state displayed by all other beta Australian skinks must have evolved: *Leiolopisma weeksae, challengeri* and *mustelina* have paired frontoparietals while all other Australian betas have fused frontoparietals.[3]

[1] The only other skinks with a reduced number of fingers and toes previously considered to be in the genus *Ablepharus* are six Australian species: *elegans, distinguenda, orientalis, muelleri, timida, lineata.* These species are now considered to be congeneric (genus *Lerista*) with the Australian skinks formerly referred to *Rhodona* (Greer, 1967a), and are only distantly related to any of the alpha or beta skinks discussed in this paper.

[2] In the single specimen of *Ablepharus burnetti* available to us (MCZ 6486) there is a small palpebral slit remaining along the dorsal edge of the lower eyelid. The eye is effectively "ablepharine," however, as this free dorsal edge is surely too short to allow much movement of the eyelid.

[3] *Geomyersia grabra* may be distinguished from the 2 beta Australian *Leiolopisma* with fused frontoparietals and 5 fingers (*guichenoti* and *delicata*) by the complete absence of prefrontal scales and the depressed body form.

These 3 primitive beta Australian *Leiolopisma* cannot, at this stage of the study, be distinguished morphologically as a group from the African beta *Leiolopisma,* all of which have 5 fingers and separated frontoparietals. This similarity could be the result of either convergence or close relationship. For the present the widely disjunct distribution of the two groups implies to us that the groups have arisen independently in each area, but, admittedly, this is an unsolved problem and will be dealt with elsewhere.

(3) Taken as a group the African betas are themselves taxonomically difficult at an infragroup level. Several characters might be used to distinguish taxa within the African betas: the presence of supranasals, presumably a primitive condition, serves to diagnose *Panaspis;* a scaly lower eyelid, minute ear opening and a group tendency toward an elongate body and reduced number of digits distinguishes *Leptosiaphos;* the ablepharine eye and reduced number of supraocular scales (3 instead of 4) defines the African "*Ablepharus,*" while an African group of *Leiolopisma* could be "diagnosed" negatively on the basis of showing none of these characters. Certain species, however, bridge these apparent taxonomic gaps. For example, *Panaspis cabindae* may have 3 instead of 4 supraoculars (Parker, 1936), and in *P. breviceps* the supranasal may be fused to the nasal (Smith, 1937); in addition, *Leptosiaphos kilimense* and *L. rhodurus* are atypical of other *Leptosiaphos* in displaying a transparent window in the movable lower eyelid. Such difficulties suggest that on the basis of these characters, it might be better to resort to, at most, a subgeneric scheme of ranking taxa.

(4) On the basis of geography, *Geomyersia glabra* would seem more closely related to Australian betas than to African betas. In addition the fused frontoparietals of *G. glabra* may be a morphological indication of relationship with the Australian betas which possess this advanced character in 26 of the 29 species. The African betas have divided frontoparietals, presumably the more primitive condition, in all but one of the 27 species. Only in the African beta *Ablepharus wahlbergi* are the frontoparietals normally fused,[1] a condition probably derived independently from that of the Australian betas with fused frontoparietals.

[1] The fusion of the frontoparietals and their fusion with the interparietal is a variable condition in *A. wahlbergi* (personal observation and de Witte, 1953).

Geomyersia glabra does, however, have 5 fingers — a character which is predominant in the African betas and which might, therefore, be thought to indicate greater likelihood of relationship with African rather than Australian beta skinks. However, 5 fingers is the primitive condition for both the African and Australian betas, and although in the Australian betas the 4 fingered species are a conspicuous element in that group's radiation, the 5 fingered *G. glabra* can be readily interpreted as a relic of an early stage in the evolutionary history of Australian betas. It would presumably represent a stage later than that of *Leiolopisma weeksae, L. challengeri* and *L. mustelina* and approximating that of *L. guichenoti* and *L. delicata,* but with specializations of its own.

Certainly the island of Bougainville on the periphery of the Australian region would be a logical refuge in which to find a relic of an early stage of a radiation taking place in this region.

A dendrogram of the Australian beta skinks, assuming on the basis of present evidence — mainly geographic — that they are monophyletic, is presented in Figure 5.

The radiations of the Australian and African beta skinks will be discussed further in forthcoming papers.

Comparisons with Morphologically Similar Species: It is desirable to mention briefly those species in the Australian Region that are confusingly similar to *Geomyersia glabra* on the basis of external morphology. Only those skinks displaying the external characters of the alpha and beta skinks are discussed.

Leiolopisma mccooyi (Lucas and Frost, 1894) from Victoria lacks prefrontals and has a minute external ear opening as does *G. glabra,* but the frontoparietals of *mccooyi* are divided, the body is not depressed, and the palate is of definitely alpha type.

Lygosoma graciloides Lönnberg and Anderson, 1913 (=*Lygosoma scharffi* Boulenger, 1915) has been collected twice and is known from 4 specimens. Although described twice under the genus *Lygosoma,* the species has the clear spectacle and other external characteristics of the alpha and beta skinks outlined above. Like *Geomyersia glabra* the prefrontals are absent and the ear opening is minute, but *L. graciloides* differs from *Geomyersia glabra* in having paired frontoparietals and only 4 fingers. More important, however, are the palatal differences, for *L. graciloides* is an alpha skink.

The three endemic *Anotis* (or *Siaphos*) on New Caledonia — *mariae, gracile,* and *slevini* — are undoubtedly closely related to

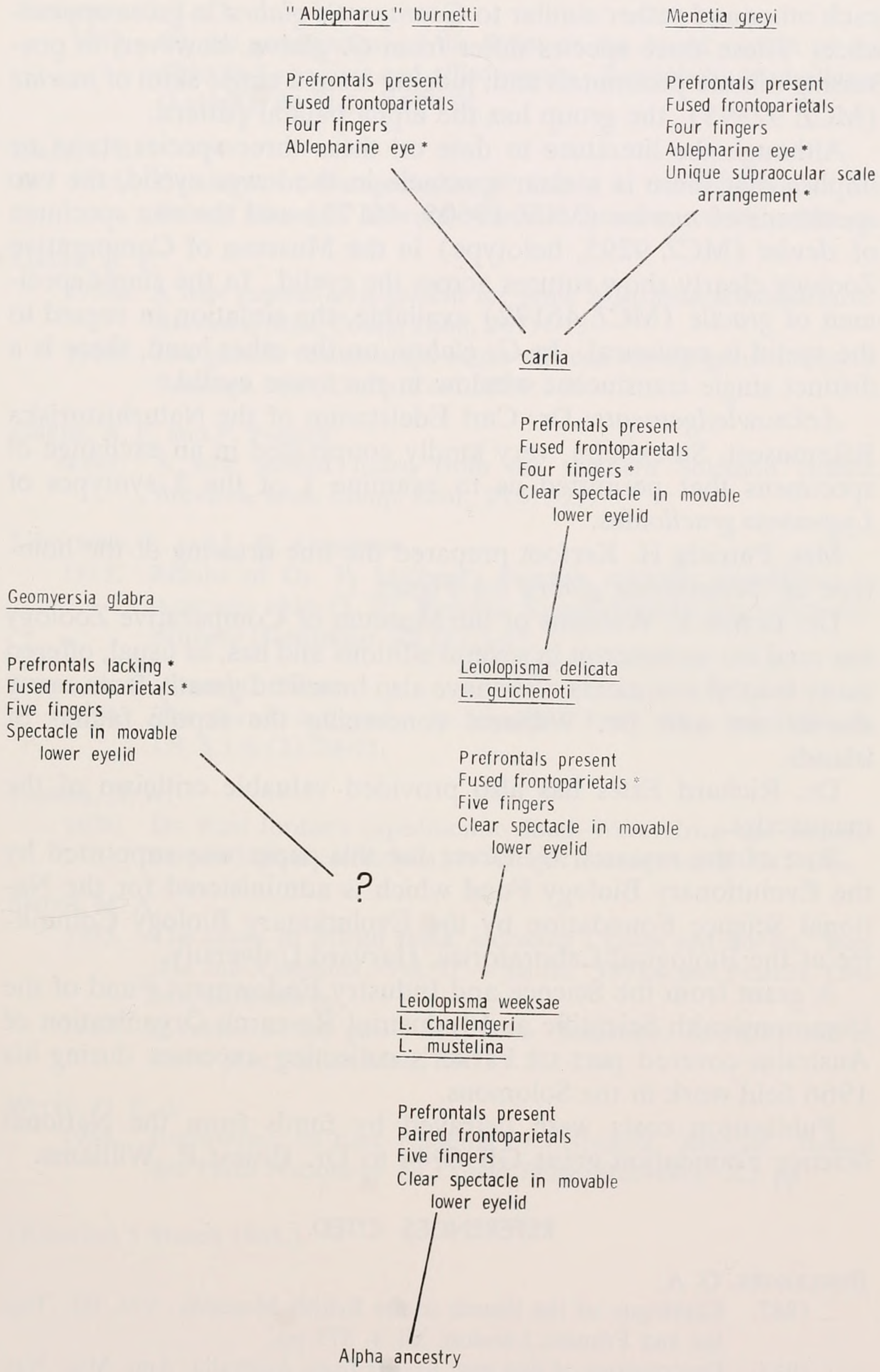


Figure 5. A dendrogram of the Australian Region beta skinks. Changes in character states of a taxon over its immediate hypothetical ancestral condition are marked with an asterisk (*).

each other and rather similar to *Geomyersia glabra* in gross appearance. These three species differ from *G. glabra,* however, in possessing minute prefrontals and, judging from a single skull of *mariae* (MCZ 92393), the group has the alpha palatal pattern.

Although the literature to date on these three species states or implies that there is a clear spectacle in the lower eyelid, the two specimens of *mariae* (MCZ 19605, 46177) and the one specimen of *slevini* (MCZ 9295, holotype) in the Museum of Comparative Zoology clearly show sutures across the eyelid. In the single specimen of *gracile* (MCZ 46172) available, the situation in regard to the eyelid is equivocal. In *G. glabra,* on the other hand, there is a distinct single translucent window in the lower eyelid.

Acknowledgements: Dr. Carl Edelstamm of the Naturhistoriska Riksmuseet, Stockholm, very kindly cooperated in an exchange of specimens that permitted us to examine 1 of the 3 syntypes of *Lygosoma graciloides.*

Mrs. Patricia H. Kerfoot prepared the line drawing of the holotype of *Geomyersia glabra* for Figure 1.

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